TL 209292

OPERATING INSTRUCTIONS

TYPE 1560-P40

PREAMPLIFIER

GENERAL RADIO COMPANY

A

OPERATING INSTRUCTIONS

TYPE 1560-P40

PREAMPLIFIER

Form 1560-0260-A
August, 1965

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West Concord, Massachusetts, USA

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

SPECIFICATIONS

Gain: 1:1 or 10:1 (20 dB) ±0.3 dB at 25°C. Less than ±0.3 dB change in gain from -50°C to 55°C.

Input Capacitance: 6 pF.

Input Resistance: > 500 MΩ at low audio frequencies.

Output Resistance: 1:1 gain—approx 5 Ω.
10:1 gain—approx 100 Ω.

Noise: < 2.5 μV equivalent input voltage (400-pF source impedance, C-weighted, 10-kc effective bandwidth).

Harmonic Distortion at Audio Frequencies: Open circuit, at 1 V, peak-to-peak: < 0.25%. Capacitor load of 0.01 μF (equivalent to a cable over 200 ft long): Maximum output (peak-to-peak) at 1% distortion is 5 V for 1 kc/s, 2 V for 10 kc/s.

Power Required: 15 V to 25 V, 1 mA to 2 mA, dc.

Dimensions: length 6 7/8, diameter 1 in. (175, 26 mm).

Net Weight: 9 oz (0.3 kg).

Shipping Weight: 3 lb (1.4 kg).

Frequency Response: at 0.5 peak-to-peak open circuit output.

1:1 gain	
0°C to 55°C	±1 dB, 1 c/s to 500 kc/s
	±0.25 dB, 3 c/s to 500 kc/s
-30°C to 55°C	±1 dB, 5 c/s to 500 kc/s
	±0.25 dB, 20 c/s to 500 kc/s
10:1 gain	
-30°C to 55°C	±3 dB, 3 c/s to 500 kc/s
	±1 dB, 10 c/s to 500 kc/s
	±0.25 dB, 20 c/s to 250 kc/s

NOTE

The capacitance of the output coupling capacitor, 1 μF ±20% at 25°C, may decrease to 10% of nominal value at -30°C or 75% of nominal at 55°C. This decrease in capacitance will affect the output level and/or frequency response when the preamplifier is loaded with a long cable or other than a high impedance load.

Descriptions of the accessories for the preamplifier and a list of the available combination sets are included in the Appendix of this book, pages 22 and 23.

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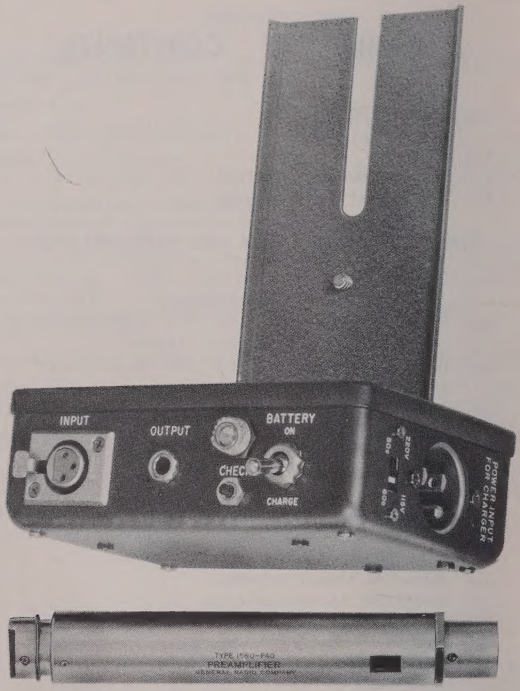


Figure 1-1. Type 1560-P40 Preamplifier with Type 1560-4100 Power Supply and mounting bracket.

SECTION **1**

INTRODUCTION

1.1 PURPOSE.

The Type 1560-P40 Preamplifier (Figure 1-1) is a low-noise amplifier designed to couple a microphone to a coaxial cable without loss or with a voltage gain of 10 to 1. It is also useful as a calibrated preamplifier of signals to analyzers, voltmeters, recorders, sound-level meters, and other such instruments. With the adaptors supplied and available, nearly all types of connectors can be connected to the input of the preamplifier.

A shielded battery power supply, Type 1560-4100 (Figure 1-1) is available to supply power to the Type 1560-P40 Preamplifier for those applications where no other suitable source of power is available.

1.2 MECHANICAL DESCRIPTION.

1.2.1 PREAMPLIFIER.

The preamplifier is housed in a one-inch-diameter tube that is finished in brushed chrome. A one-inch hexagonal section on one end prevents the preamplifier from rolling when it is placed on a flat surface. When a microphone is mounted directly on the input end of the preamplifier, diffraction and reflection of acoustic energy are minimized by the small diameter of the tube.

The cartridge of the General Radio Type 1560-P5 Microphone can be attached directly to the input end of the preamplifier. A groove on the end piece enables the preamplifier and microphone to be attached to the General Radio Type 1559-A or -B Microphone Reciprocity Calibrator for direct acoustical calibration of the microphone and preamplifier or of the complete measurement system. An adaptor is available to mount the cartridge of the Type 1560-P3 Microphone solidly on the preamplifier without inserting a three-terminal microphone connector between the

cartridge and the preamplifier input terminals. Also, this combination of microphone, adaptor, and preamplifier can be attached to the Type 1559-A or -B Microphone Reciprocity Calibrator. Other adaptors are available to adapt the input to three-terminal microphone connectors and to the GR874 Coaxila Connectors. Thus, by means of the various GR874 Adaptors, it is possible to connect the input end of the preamplifier to almost any available type of connector.

1.2.2 POWER SUPPLY.

The Type 1560-4100 Power Supply includes two nickel-cadmium rechargeable batteries, a battery-charging circuit, and a battery-checking circuit, all enclosed in an aluminum case. The controls (see Figure 1-2) include a toggle switch (engraved BATTERY ON and CHARGE), a push-button switch (engraved BATTERY CHECK) with an indicator lamp, and a recessed slide switch to set to the correct power-line voltage for battery charging. A bracket is supplied to attach the power supply to any of several portable GR instruments.

The power supply is available with the preamplifier in the Type 1560-P40H Preamplifier and Power Supply Set, which includes the necessary adaptors and cables. (Other available sets are listed on page 23).

1.3 ELECTRICAL DESCRIPTION.

Two pins of a three-terminal microphone connector at the output end of the preamplifier connect to the preamplifier output; the third pin is used to feed power to the circuit.

The active elements of the preamplifier are: one N-channel, field-effect transistor and two conventional transistors. The field-effect transistor, specially selected for low noise, is connected as a source follower and feeds the two conventional transistors, which are connected as a negative-feedback pair. The feedback is switched to provide a voltage gain of either 1 or 10.

Figure 1-2. Type 1560-4100 Power Supply showing panel controls and method of attaching bracket.

SECTION **2**

SUPPLYING POWER FOR THE PREAMPLIFIER

2.1 GENERAL.

The power required by the preamplifier is 15 to 25 volts at 1 or 2 milliamperes. Types 1558-A and -AP Octave-Band Noise Analyzers, and the Type 1564-A Sound and Vibration Analyzers of current manufacture are designed to provide the power necessary for the Type 1560-P40 Preamplifier from their three-terminal input connectors. The preamplifier can be plugged directly into the connector, or a two-conductor shielded cable, such as those of the Type 1560-P72 series, can be used. Older instruments of the above types, and the Type 1551-C Sound-Level Meter and the Type 1553-A Vibration Meter do not ordinarily supply the required power, but they can be modified as described below (refer to paragraphs 2.3 through 2.5). BL# 209288 IS MODIFIED

2.2 TYPE 1560-4100 POWER SUPPLY.

2.2.1 BATTERY CHARGING.

Always check the battery voltage before using the Type 1560-4100 Power Supply to power the Type 1560-P40 Preamplifier. Set the BATTERY toggle switch to ON. Push the BATTERY CHECK switch. If the indicator lamp does not light, or if it glows for only a short time, the batteries should be recharged. The indicator lamp will not light when the battery voltage drops below 16 volts.

To charge the batteries, set the power-line switch to the voltage and frequency of the available power line. Connect the power supply to the line using the cord provided, then set the toggle switch to CHARGE. Discharged batteries can be fully recharged in 14 to 16 hours.

NOTE

If the power-line rating is 115 volts and 50 c/s instead of 60 c/s, the battery charging current will be low; discharged batteries can be fully recharged in 17 to 20 hours. The charging current can be increased to the nominal 22 mA by changing resistor R501 (Figure 4-1) to 1800 ohms, 5 watts.

If the power-line rating is 230 volts and 60 c/s instead of 50 c/s, the charging current will be too high. Resistor R505 (Figure 4-1) must be increased to 9100 ohms, 2 watts, if frequent recharging at this line voltage and frequency is necessary.

2.2.2 USE OF THE POWER SUPPLY.

The output connector of the Type 1560-P40 Preamplifier can be plugged directly into the INPUT socket of the Type 1560-4100 Power Supply or connected to it with a two-conductor shielded cable. Power is applied to the preamplifier when the BATTERY switch is in the ON position; the power is disconnected when the switch is in the CHARGE position.

The output signal from the preamplifier is accessible at the OUTPUT phone jack on the power supply. The jack can be connected to Type 938 Binding Posts by means of the Type 1560-P95 Cable, or to a three-terminal microphone connector by means of the Type 1560-P99 Cable. A Type 874-Q2 Adaptor, with a Type 1560-P95 Cable, makes it possible to connect the phone jack to a GR874 Coaxial Connector.

2.2.3 ATTACHING THE POWER SUPPLY.

The Type 1560-4100 Power Supply can be attached to several portable General Radio instruments by means of the bracket that is supplied. The procedure is as follows:

a. Remove the four screws that fasten the bottom plate to the power supply.

b. Place the flat plate section of the bracket over the bottom plate, with the slotted leg to the rear (see Figure 1-2), and fasten the two plates to the power supply with the four screws.

c. Lock the Flip-Tilt cover of the instrument to which the power supply is to be attached in the fully open position.

d. Place the power supply beside the instrument, with the slot in the bracket over the tripod socket on the cover of the instrument. Clamp the bracket in the desired position; use the thumbscrew supplied. With the adaptor provided, the thumbscrew may be used with either a 1/4- or 3/8-inch tripod socket.

2.3 POWER SUPPLIED BY TYPE 1551-C SOUND-LEVEL METER OR TYPE 1553-A VIBRATION METER. TL 209288 IS MODIFIED

The Type 1551-C Sound-Level Meter and the Type 1553-A Vibration Meter are not normally provided with this power capability. However, it can be added if required, preferably by a General Radio service facility. For more detailed information about this modification, write or phone the nearest General Radio sales-engineering office.

2.4 POWER SUPPLIED BY TYPE 1558 OCTAVE-BAND NOISE ANALYZER.

Type 1558-A or -AP Octave-Band Noise Analyzers supplied prior to August, 1964, are not wired to provide power for the preamplifier. These instruments will be modified, without charge, at any General Radio sales office that includes a service facility (see back cover), to provide the required power at the input connector. The modification can be made by connecting a lead from the positive end of capacitor C501 to terminal #2 of the MIKE socket (refer to the Operating Instructions for the Type 1558 Octave-Band Noise Analyzers, Figures 4-3 and 4-7).

2.5 POWER SUPPLIED BY TYPE 1564-A SOUND AND VIBRATION ANALYZER.

Type 1564-A Sound and Vibration Analyzers supplied prior to February, 1965, are not wired to supply power for the preamplifier. It is recommended that these instruments be returned to a General Radio sales-engineering office that includes a service facility, for no-charge modification to provide the required power. However, a modification kit consisting of a lead, a resistor (240 ohms ±5%, 1/2 watt), and a transistor (Type 2N697) will be supplied without charge by any General Radio sales-engineering office.

Figure 2-1 shows the placement of the resistor and lead. Solder one end of the resistor to terminal #2 of the INPUT socket. Connect the lead from the other end of the resistor to the etched-board lead that connects to the emitter of transistor Q505. Replace this transistor with the Type 2N697 transistor supplied in the modification kit.

CAUTION

Terminal #2 is connected to ground (terminal #1) on the connectors of some microphones, accelerometers, control boxes, and cables supplied by General Radio prior to January, 1962. If necessary, remove the connection between pins #1 and #2 before the above connectors are plugged into any other connector that supplies power through pin #2.

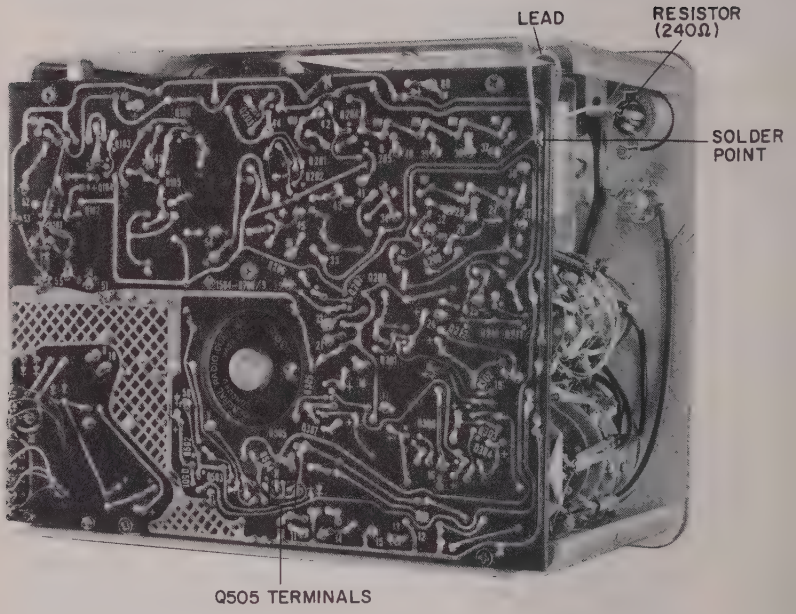


Figure 2-1. Modification of Type 1564-A Sound and Vibration Analyzer for use with the preamplifier.

SECTION **3**

OPERATING PROCEDURE

3.1 MICROPHONE OR ADAPTOR ATTACHMENT.

The cartridge of the Type 1560-P5 Microphone and the Types 1560-P96, -P97, and -P98 Adaptors can be locked to the preamplifier by backing out two shouldered screws against the cartridge or the adaptor. Use the following procedure:

a. Turn in the two screws (A, Figure 3-1), using the hexagonal wrench provided.

b. Plug the microphone or adaptor onto the preamplifier so that the red dots (engraved on the sides of each) are aligned.

c. Back out the two screws so that their tips extend through the holes in the microphone or adaptor and their shoulders press firmly against the shell.

If the Type 1560-P3 Microphone is to be used with the preamplifier, it can be attached by use of the Type 1560-P96 Adaptor for three-terminal microphone connectors; or the microphone cartridge can be removed from the connector section and attached to the Type 1560-P97 Adaptor. The latter combination is preferable, because it eliminates the electrical noise development that may occur in the three-terminal connectors when they are used in a high-impedance circuit.

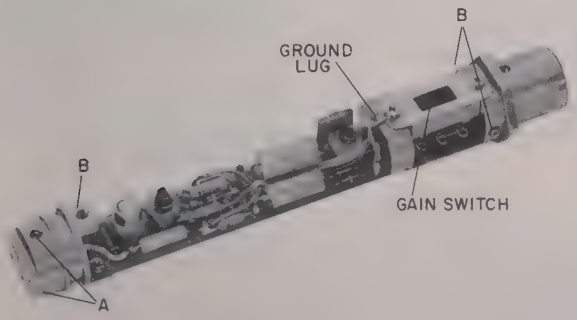


Figure 3-1. Interior view of the preamplifier.

To attach the microphone cartridge to the Type 1560-P97 Adaptor, proceed as follows:

a. Remove the three screws that attach the microphone cartridge to the Type 1560-P3 Microphone.

b. Lift off the cartridge; unclip the leads from the two connecting pins on the cartridge.

c. Plug the cartridge onto the Type 1560-P97 Adaptor and fasten it with the three screws removed in step a.

If the microphone cartridge is reassembled on the three-terminal microphone connector, the two pins must be connected correctly. Connect the lead from connector pin #1 to the grounded pin (no insulator) of the microphone cartridge.

NOTE

Cartridges for the Type 1560-P3 Microphones that have connecting leads instead of pins on the cartridge cannot be used with the Type 1560-P97 Adaptor.

3.2 MICROPHONE-SENSITIVITY CORRECTION.

When a microphone and preamplifier are used in conjunction with a Type 1551-C Sound-Level Meter, a Type 1558-A Octave-Band Noise Analyzer, or a Type 1564-A Sound and Vibration Analyzer, the effective sensitivity of the microphone is increased. This increase is brought about because the voltage loss caused by the preamplifier input-capacitance load on the microphone is less than that caused by the input-capacitance load of the above instruments. Also, when a cartridge from a Type 1560-P4 or -P6 Microphone Assembly is used, the loss caused by the capacitance of the flexible arm is not present. (The sensitivity given for a Type 1560-P4 or -P6 Microphone Assembly is for the combined microphone cartridge and flexible arm.)

To calibrate a system of microphone, preamplifier, and one of the above-named instruments, a Type 1552-B Sound-Level Calibrator or a Type 1559-B Microphone Reciprocity Calibrator is recommended. Alternatively, the correction data given in Table 3-1 can be used to correct the

TABLE 3-1

MICROPHONE-SENSITIVITY CORRECTION IN DECIBELS

	Measuring Instrument		
Microphone Cartridge	*Type 1551-C*	*Type 1558-A, -AP*	*Type 1564-A*
Type 1560-P3 or -P5	0.9	1.0	1.4
Type 1560-P4 or -P6	1.5	1.6	2.1

sensitivity value given for the particular microphone being used. Add the correction algebraically to the specified microphone sensitivity value to obtain the effective sensitivity value. This corrected value can then be used to calibrate the measuring instrument, as directed in the Operating Instructions for the latter. If a Type 1552-B Sound-Level Calibrator is used to calibrate the system, the gain of the preamplifier should be set at X1, to prevent its possible overload (see Figure 3-2). If the system is calibrated with a Type 1559-B Microphone Reciprocity Calibrator, the preamplifier gain may be set at either X1 or X10.

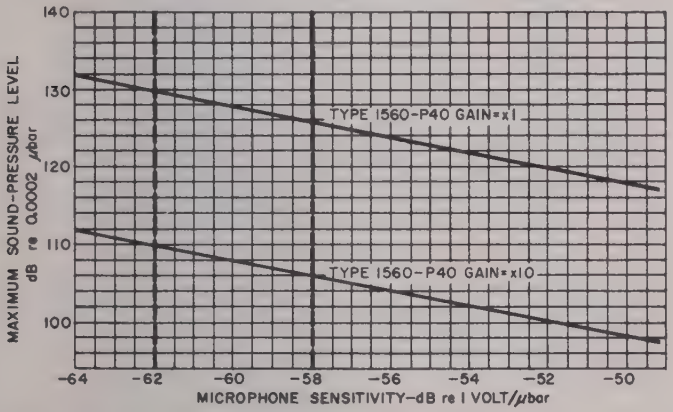


Figure 3-2. Maximum sound-pressure level that can be measured with a Type 1560-P40 Preamplifier and microphone combination. The sensitivities of Types 1560-P3, -P4, -P5, and -P6 Microphones will fall between the dotted lines. Allowance is made for a peak-to-rms ratio of 14 dB. For a sine-wave acoustic signal, the maximum level can be increased by 11 dB.

3.3 ELECTRICAL-SIGNAL MEASUREMENTS.

3.3.1 GENERAL.

Connect the preamplifier to its source of power (refer to Section 2) and connect the input signal to the preamplifier by means of the correct adaptor. Set the gain switch (see Figure 1-1) to the desired gain, either X1 or X10, as engraved on the switch.

NOTE

When power is applied to the preamplifier, about one-half minute is required for the input stage to stabilize and for the preamplifier to operate.

With a high-impedance load on the preamplifier, audio-frequency voltage up to 0.5 volt peak-to-peak at X10 gain or 5 volts peak-to-peak at X1 gain may be applied to the preamplifier input.

Because of the low output impedance of the preamplifier, a long cable may be used between the preamplifier and the measuring instrument. At X10 gain, up to one-half mile of cable may be used; at X1 gain, up to one mile is satisfactory. Figure 3-3 shows the attenuation versus frequency for three different lengths of cable. The fixed loss for each length

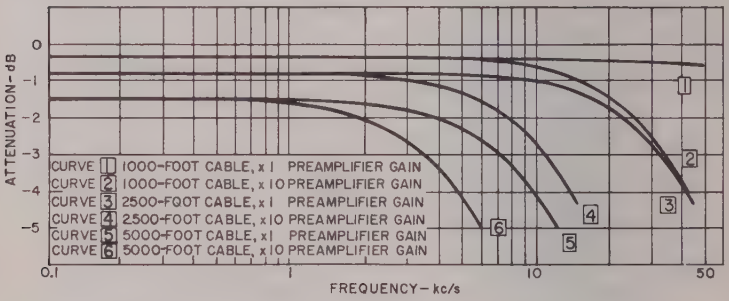


Figure 3-3. Attenuation of the preamplifier output signal caused by the capacitance of the cable between the preamplifier and the measuring instrument. The cable material is GR Part No. ESMW-91, as used in Type 1560-P72 Cables.

is caused by the divider formed by the preamplifier output coupling capacitor and the cable capacitance. When a long connecting cable is used, output from the preamplifier may have to be restricted because of the low reactance load of the cable. Figure 3-4 shows cable length versus maximum voltage output at three different frequencies, for a maximum distortion of 1%. The maximum sound-pressure level that should be measured is also shown.

Figure 3-5 gives the noise level of the preamplifier in the form of curves of typical values for the e_n and i_n generators[1] versus frequency.

3.3.2 GROUNDING.

Normally, the low side of the preamplifier circuit is connected to the shell, which may be grounded by the ground of the measuring system. Occasionally, however, problems arise from multiple ground loops caused by grounds at different points in a system. As an aid in solving such special problems, the grounding connection from the preamplifier circuit to the shell can be disconnected easily. Remove the cylindrical tube from

[1] A. E. Sanderson and R. G. Fulks, "A Simplified Noise Theory and Its Application to the Design of Low-Noise Amplifiers," NEREM 1960 Record, General Radio Reprint No. A-88.

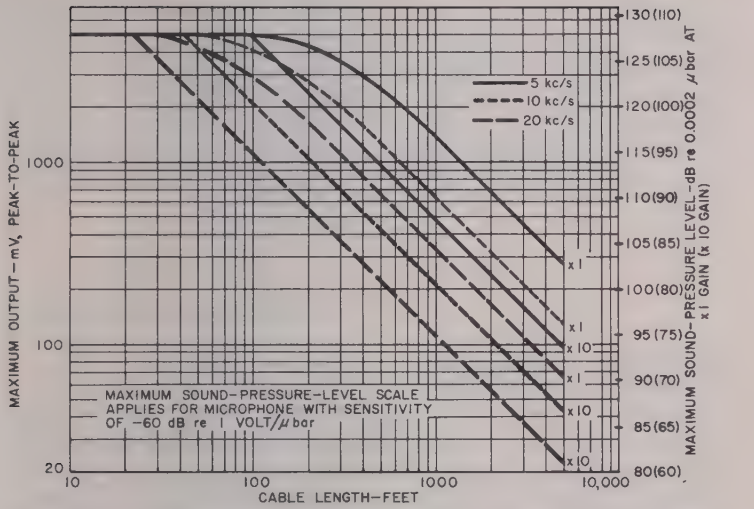


Figure 3-4. Curves showing the maximum output for a maximum distortion of one percent when a long cable terminated in a high-impedance load is driven. Allowance is made on the maximum sound-pressure-level scale for an acoustic waveform having a peak-to-rms ratio of 14 dB. With a sine-wave signal, the maximum sound-pressure level can be increased by 11 dB.

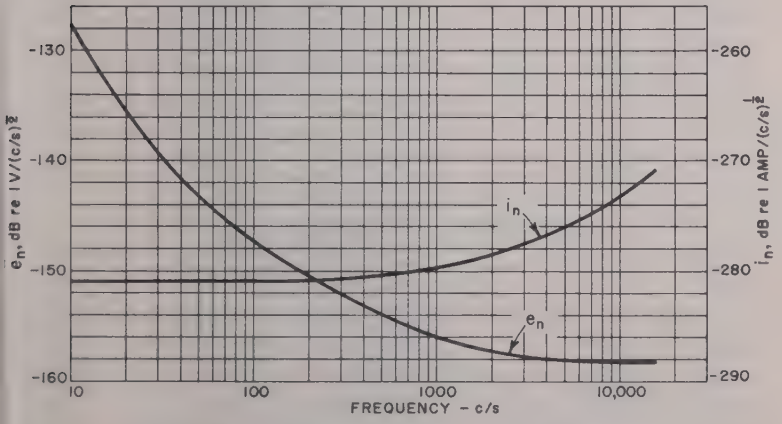


Figure 3-5. Typical frequency spectra of internal noise.

the preamplifier (refer to paragraph 4.3.2). Then remove the screw holding the ground lug at the end of the gain switch (see Figure 3-1). Bend the connecting lead so that the lug can not contact the shell or any part of the circuit. Then replace the screw. Also, be sure that the circuit is not grounded to the shell by the input or output connector. If cable connections are used, a two-conductor shielded cable for the input and a three-conductor shielded cable for the output are required. The shields must connect to the shell. The low side of the preamplifier circuit connects to terminal #1 of the three-terminal output plug.

3.4 ACOUSTIC MEASUREMENTS.

In acoustic measurements, the preamplifier can be used to increase by 20 dB the sensitivity of the Types 1558-A, 1558-AP, and 1564 Analyzers. In conjunction with the preamplifier, these instruments can be used for measurements down to a sound-pressure level of 24 dB re .0002 μbar.

The preamplifier is also useful with the Type 1551-C Sound-Level Meter, as well as with the above instruments, when a long cable must be used. The preamplifier eliminates the loss caused by a long cable used directly after a microphone (refer to paragraph 3.3.1).

Attach the microphone to the preamplifier as described in paragraph 3.1. Connect the preamplifier to its power source and to the measuring instrument (which may also be the power source; refer to paragraphs 2.3 through 2.5). Slide the gain switch (see Figure 3-1) to the desired gain, X1 or X10, as engraved on the switch. When the gain is X10, subtract 20 dB from the decibel reading of the measuring instrument to obtain the noise level at the microphone.

When a cable is used to connect them to the measuring instrument, the preamplifier and microphone can be mounted on the Type 1560-P32 Tripod. The measuring instrument and the observer can then be located at the other end of the cable, far enough removed from the acoustic field to have little or no effect on the accuracy of the measurement.

When a short connecting cable, or none at all, is used, the maximum noise level that can be measured without the possibility of overloading the amplifier is given in Figure 3-2. Allowance is made for a peak-to-rms ratio of 14 dB, which is adequate for normal noise.

When a long connecting cable is used, the maximum noise level that should be measured is given in Figure 3-4. The maximum value obtained from the figure will usually be pessimistic for broadband noise measurements, since the high-frequency components of such noise usually are of lower level than the low-frequency components.

For a complete discussion of the techniques of noise measurement, refer to the General Radio Handbook of Noise Measurement.

NOTE

When the preamplifier-and-microphone assembly is used, particularly when low sound levels are measured, the assembly should be protected from mechanical vibration, such as that caused by rubbing against another object. The vibration is transmitted through the mechanical structure to the microphone, and the resulting electrical signal from the microphone may cause a large error in the measurement.

3.5 VIBRATION MEASUREMENTS.

The preamplifier can be used to advantage with the Type 1553 Vibration Meter and the Type 1564-A Sound and Vibration Analyzer for vibration measurement and analysis. It permits the use of long cables without loss and increases the sensitivity of the measuring instrument by 20 dB.

Attach the Type 1560-P96 Adaptor to the preamplifier as described in paragraph 3.1. Plug the vibration-pickup cable into the adaptor. Connect the preamplifier to its power source and to the measuring instrument (refer to paragraphs 2.3 through 2.5). Slide the gain switch to the desired gain (X1 or X10). If the preamplifier is used at X10 gain, divide the readings of the measuring instrument by 10. If readings are taken in decibels, subtract 20 dB.

Table 3-2 lists the maximum vibration acceleration that should be measured when General Radio vibration pickups are used with the Type 1560-P40 Preamplifier.

The Type 1557-A Vibration Calibrator can be used to calibrate the Types 1560-P52 and -P53 Pickups with either X1 or X10 preamplifier gain. The Type 1560-P54 Pickup should be calibrated only with X1 gain.

TABLE 3-2

MAXIMUM VIBRATION ACCELERATION TO BE MEASURED WITH VARIOUS PICKUPS.

Pickup	*X1 Preamplifier Gain*	*X10 Preamplifier Gain*
Type 1560-P52	5.5 g	0.55 g
Type 1560-P53	5.5 g	0.55 g
Type 1560-P54	0.79 g	0.079 g

3.6 OTHER APPLICATIONS.

The preamplifier provides added sensitivity, at a very high input impedance, to a wide variety of instruments. These instruments are listed in Table 3-3. The Type 1560-4100 Power Supply is required when the preamplifier is used with any of these instruments.

TABLE 3-3

INSTRUMENTS WITH WHICH THE TYPE 1560-P40 PREAMPLIFIER (WITH THE TYPE 1560-4100 POWER SUPPLY) CAN BE USED FOR ADDED SENSITIVITY.

Type No.	*Name*
1900-A	Wave Analyzer
1565-A	Sound-Level Meter
1142-A	Frequency Meter and Discriminator
1150 series	Digital Frequency Meters
1206-B	Unit Amplifier
1232-A	Tuned Amplifier and Null Detector
1233-A	Power Amplifier
1521-B	Graphic Level Recorder
1806-A	Electronic Voltmeter

SECTION **4**

SERVICE AND MAINTENANCE

4.1 WARRANTY.

We warrant that each new instrument sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, sales-engineering office, or authorized repair-agency personnel, will be repaired, or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

4.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest sales-engineering office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

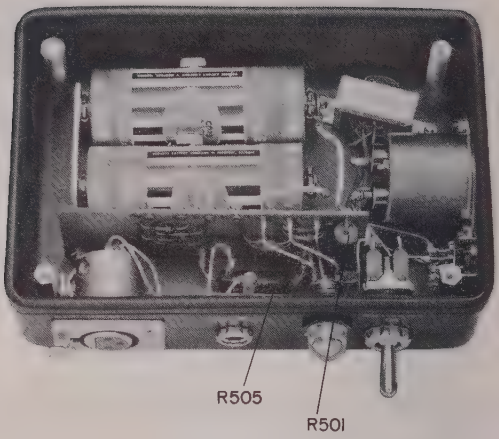


Figure 4-1. Interior view of the power supply.

4.3 SERVICING.

4.3.1 TYPE 1560-4100 POWER SUPPLY.

Remove the four screws that attach the bracket and the cover plate and remove the bracket and plate. Figures 4-1 and 4-4 show the locations of all components.

Table 4-1 gives the normal voltage from each transistor terminal to ground. Depress the BATTERY CHECK button. Measure the voltages with a vacuum-tube voltmeter and with a battery voltage of about 21 volts (nearly fully charged). A 10-percent deviation from the listed values is allowable.

At nominal line voltage (marked on the case, near the line-voltage switch), the battery-charging current should be 22 milliamperes ±10%. Measure the current with an average-reading dc meter.

TABLE 4-1

POWER SUPPLY TRANSISTOR VOLTAGES.

Transistor	*Terminal*	*Dc Volts to Ground*
Q501	COLLECTOR	6.9
	BASE	7.4
	EMITTER	6.8

4.3.2 TYPE 1560-P40 PREAMPLIFIER.

Using the hexagonal wrench provided, screw in the three shouldered screws (B, Figure 3-1) until the cylindrical tube can be removed from the preamplifier. Figures 3-1 and 4-2 show the locations of the components.

Table 4-2 lists normal voltages from each transistor to ground. Measure the voltages with a vacuum-tube voltmeter and with a battery voltage of 21 volts. A 10-percent deviation from the listed values is allowable.

TABLE 4-2

PREAMPLIFIER TRANSISTOR VOLTAGES.

Transistor	*Terminal*	*Dc Volts to Ground*
Q101	DRAIN	21.0
	SOURCE	8.0
	GATE	8.1
Q102	COLLECTOR	16.6
	BASE	8.0
	EMITTER	7.5
Q103	COLLECTOR	11.5
	BASE	7.9
	EMITTER	7.3

Before making measurements, short-circuit the preamplifier input terminals. Install a resistor of about 10 megohms across resistor R101 (see Figures 4-2 and 4-3). If such a resistor is not available, momentarily short-circuit R101 before any voltages are measured. Do not attempt to measure the voltage from the gate of Q101 to ground without a shunt across resistor R101.

TYPE 1560-P40 PREAMPLIFIER PARTS LIST

Ref No.	Description	Part No.
	CAPACITORS	
C101	Plastic, .0022 μF ±2% 200 V	4860-7326
C102	Electrolytic, 22 μF ±20% 15 V	4450-5300
C103	Electrolytic, 120 μF ±20% 10 V	4450-5616
C104	Electrolytic, 120 μF ±20% 10 V	4450-5616
C105	Electrolytic, 120 μF ±20% 10 V	4450-5616
C106	Ceramic, 1.0 μF ±20% 25 V	4400-2070
	RESISTORS	
R101	Composition, 1 GΩ ±20% 1/2 W	6100-8108
R102	Composition, 27 kΩ to 150 kΩ* ±5% 1/4 W	6099
R103	Composition, 20 kΩ ±5% 1/4 W	6099-3205
R104	Composition, 56 kΩ ±5% 1/4 W	6099-3565
R105	Composition, 51 kΩ ±5% 1/4 W	6099-3515
R106	Composition, 3 kΩ ±5% 1/4 W	6099-2305
R107	Film, 0.976 kΩ to 1.07 kΩ* ±1% 1/8 W	6250
R108	Composition, 150 kΩ ±5% 1/4 W	6099-4155
R109	Film, 9.53 kΩ ±1% 1/8 W	6250-1953
R110	Composition, 39Ω to 270 Ω* ±5% 1/4 W	6099
R111	Composition, 8.2 kΩ ±5% 1/4 W	6099-2825
R112	Composition, 6.2 kΩ ±5% 1/4 W	6099-2625
R113	Composition, 1 MΩ ±5% 1/4 W	6099-5105
	MISCELLANEOUS	
PL101	Plug	4220-5306
SO101	Socket	1560-1400
S101	Switch	7910-0830
Q101	Transistor, C6601A	8210-1082
Q102	Transistor, 2N3391A	8210-1092
Q103	Transistor, 4JX16A733	8210-1083

* Value determined by General Radio Laboratory.

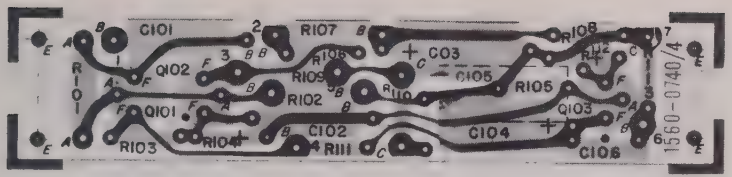


Figure 4-2. Etched-board layout for the Type 1560-P40 Preamplifier.

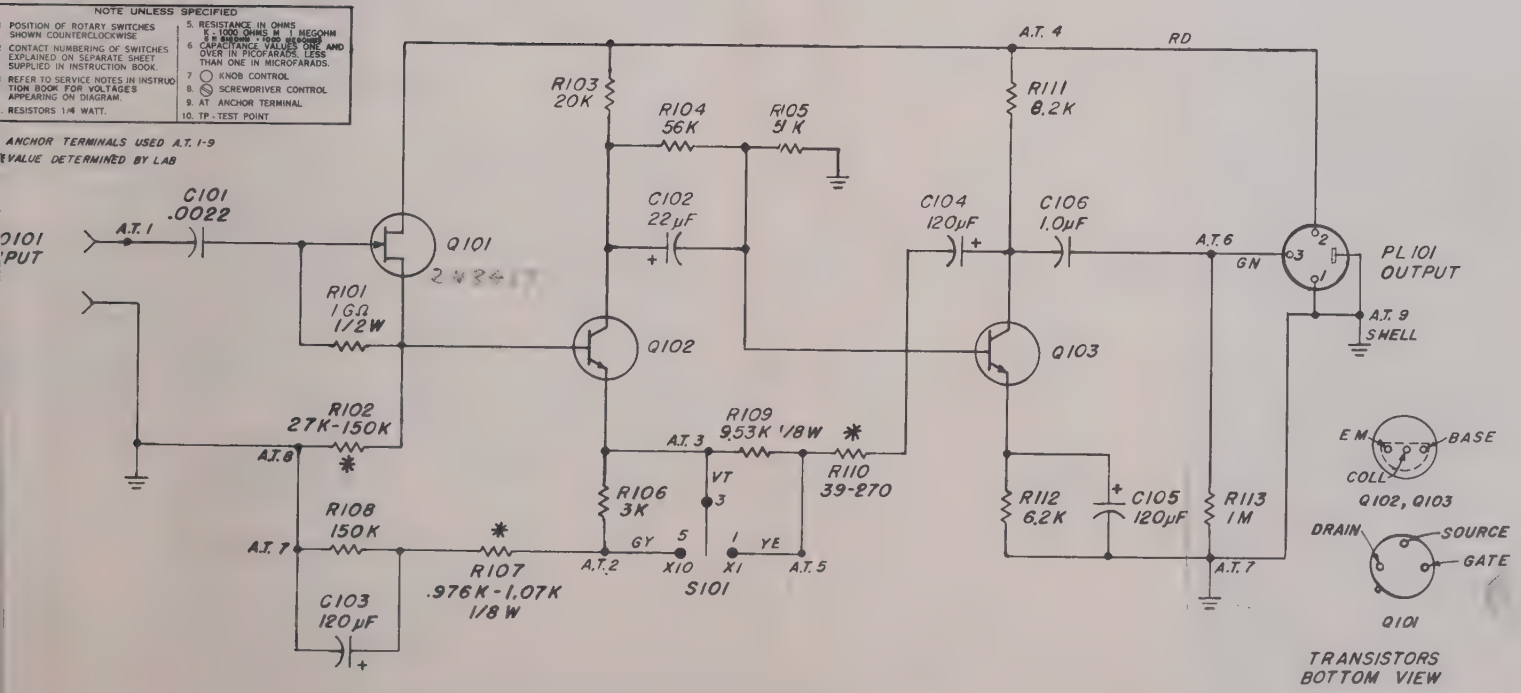


Figure 4-3. Schematic diagram for the Type1560-P40 Preamplifier.

TYPE 1560-4100 POWER SUPPLY

PARTS LIST

Ref No.	Description	Part No.
	RESISTORS	
R501	Composition, 2.7 kΩ ±5% 2 W	6120-2275
R505	Film, 7.68 kΩ ±1% 1/8 W	6250-1768
R503	Film, 7.15 kΩ ±1% 1/8 W	6250-1715
R504	Composition, 300 Ω ±5% 1/4 W	6099-1305
R505	Power, 6.8 kΩ ±5% 5 W	6660-2685
	MISCELLANEOUS	
B501	Battery, 9.6 V	8410-1040
B502	Battery, 9.6 V	8410-1040
CR501	Diode, 1N645	6082-1016
CR502	Diode, 1N645	6082-1016
CR503	Diode, 1N645	6082-1016
CR504	Diode, 1N645	6082-1016
CR505	Diode, 1N957B	6083-1009
J501	Jack	4260-1260
P501	Lamp, 10 V	5600-0314
PL501	Plug	4240-0702
SO501	Socket	4230-2693
S501	Switch	7910-1500
S502	Switch	7870-1120
S503	Switch	7910-0831
Q501	Transistor, 2N2714	8210-1047
T501	Transformer	0748-4000

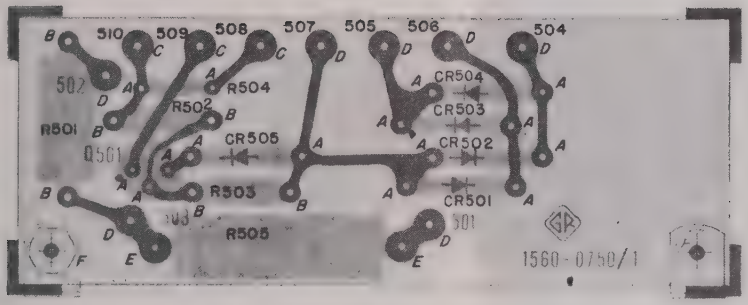


Figure 4-4. Etched-board layout for the Type 1560-4100 Power Supply.

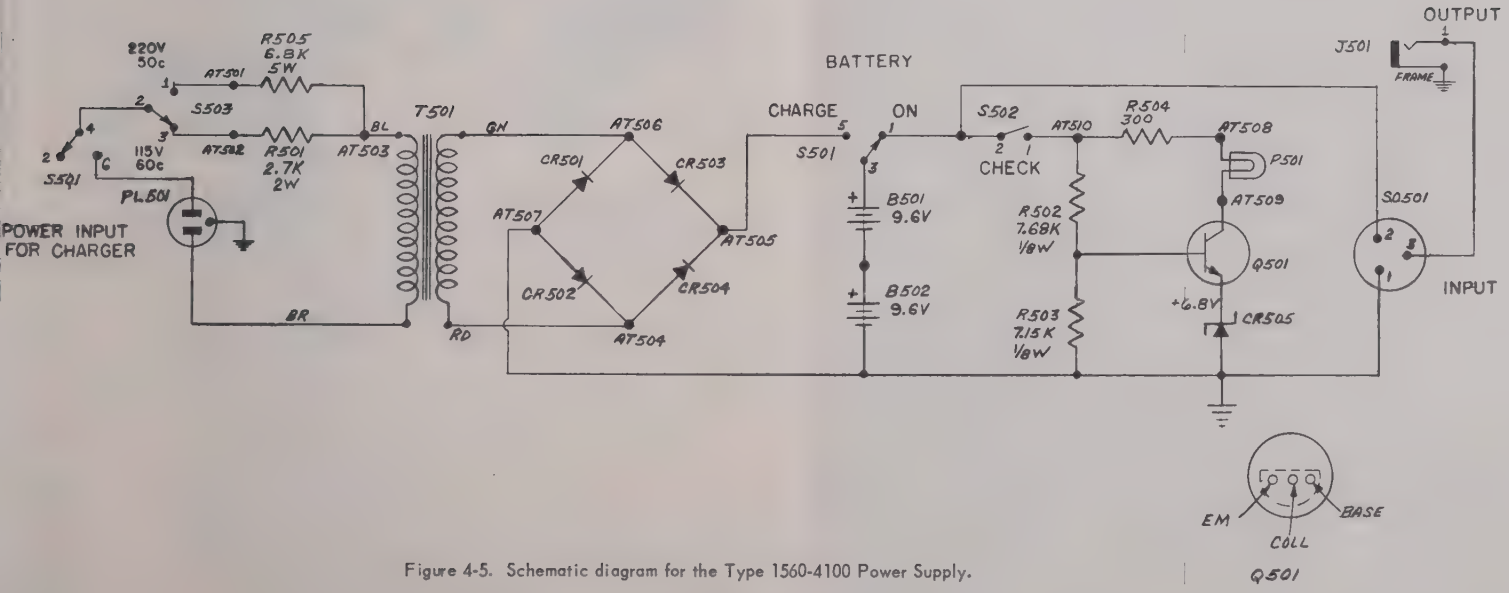


Figure 4-5. Schematic diagram for the Type 1560-4100 Power Supply.

APPENDIX

CABLES AND ADAPTORS FOR USE WITH THE TYPE 1560-P40 PREAMPLIFIER

Type 1560-P72, 25-foot Cable

Connects the preamplifier to the Type 1560-4100 Power Supply or measuring instrument supplying power; also carrier output signal from the preamplifier to a phone jack on the Type 1560-4100 Power Supply or to the measuring instrument.

Type 1560-P72C, 4-foot Cable

Same as Type 1560-P72 Cable, above, except for length.

Type 1560-P95 Adaptor Cable

Provides means of connecting the preamplifier output signal from a jack on the Type 1560-4100 Power Supply, through a cable, to a Type 274-M Double Plug.

Type 1560-P99 Adaptor Cable

Cable with phone plug on one end and 3-terminal, shielded, audio connector on the other.

Type 1560-P96 Adaptor

Adapts preamplifier input to 3-terminal, shielded audio connector.

Type 1560-P97 Adaptor

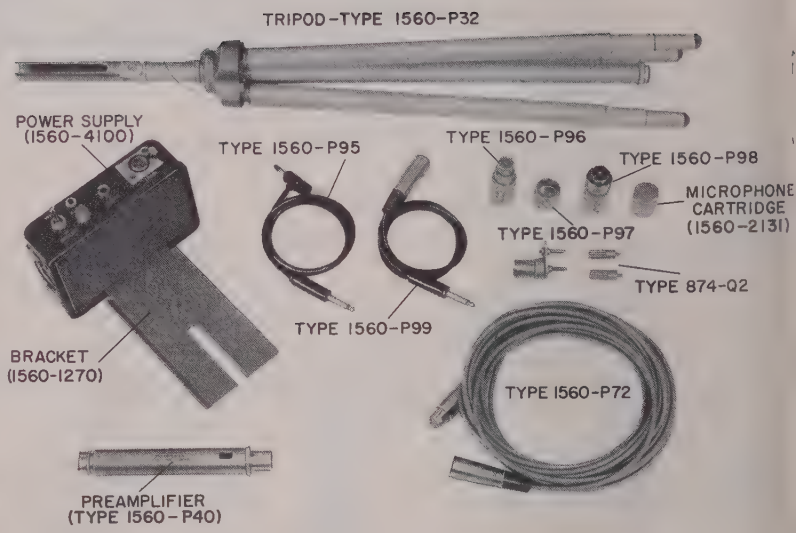
Adapts preamplifier input to cartridge of Type 1560-P3 Microphone.

Type 1560-P98 Adaptor

Adapts preamplifier input to GR874 Coaxial Connector.

Type 874-Q2 Adaptor

Adapts GR874 Coaxial Connector to Type 274 Jacks (banana-pin) on 3/4-inch spacing.



AVAILABLE COMBINATION SETS

The Type 1560-P40 Preamplifier is available with various accessories in the three sets listed below (see figure, page 22).

Type 1560-P40H Preamplifier and Power Supply Set

This set is self-powered; it is independent of any external power supply. It can be used with the Type 1565-A Sound-Level Meter or with any of the instruments listed in Table 3-3.

The following items are included in the Type 1560-P40H Preamplifier and Power Supply Set:

Type 1560-P40 Preamplifier	Type 1560-P95 Adaptor Cable
Type 1560-4100 Power Supply	Type 1560-P99 Adaptor Cable
Type 1560-P96 Adaptor	Type 1560-P72C 4-foot Cable
Type 1560-P98 Adaptor	Type 874-Q2 Adaptor

Type 1560-P40J Preamplifier and Adaptor Set

Power for the preamplifier, with this set, must be obtained from the instrument to which the preamplifier is connected, such as the Types 1558 and 1564 Analyzers; other instruments, such as the Type 1551 Sound-Level Meter and the Type 1553 Vibration Meter, must be modified to provide power for the preamplifier (refer to paragraphs 2.3, 2.4, and 2.5). If the source connector is not a type for which an adaptor is supplied, the GR874 Adaptors (listed in the General Radio Catalog) can be used with the Type 1560-P98 Adaptor (supplied) to mate with most standard coaxial connectors.

The following items are included in the Type 1560-P40J Preamplifier and Adaptor Set:

Type 1560-P40 Preamplifier	Type 1560-P98 Adaptor
Type 1560-P96 Adaptor	Type 1560-P72 4-foot Cable
Type 1560-P97 Adaptor	

Type 1560-P40K Preamplifier and Microphone Set

This set is intended for use with Types 1558 and 1564 Analyzers when an acoustic measurement is to be made at low levels or when the microphone must be located at the end of a long cable. This set can also be used with a modified Type 1551-C Sound-Level Meter (refer to paragraph 2.3) when a long microphone cable is necessary.

The following items are included in the Type 1560-P40K Preamplifier and Microphone Set:

Type 1560-P40 Preamplifier	Type 1560-P32 Tripod
Type 1560-P72C 4-foot Cable	Type 1560-2131 Microphone Cartridge
Type 1560-P72 25-foot Cable	

Type 1560-9512 Power Supply Group

The following Power Supply Group is also available:

Type 1560-4100 Power Supply	Type 1560-1270 Bracket
Type CAP-22 Three-wire Power Cord	

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